Abstract

Flight Anomaly Characterization as a Means of Evaluating Proposed Relaxations of Product Assurance and Test Requirements.

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Flight Anomaly Characterization (FAC) is a method for identifying populations of spacecraft in-flight hardware failures with common characteristics that can be anal yzed for their potential impact on spacecraft Product Assurance programs. The method was developed by the Jet Propulsion Laboratory (JPL) Reliability Engineering Section under the direction of NASA Code QT. The method uses a combined database of in-flight spacecraft and instrument anomalies from JPL, NASA Goddard Space Flight Center and Air Force programs. Once a candidate population has been identified using the procedure, it can be analyzed using conventional techniques to identify ways of preventing similar failures from occurring on future spacecraft programs. The method is useful in determining whether product assurance or ground testing requirements can be relaxed, based on spacecraft flight history.

At the present time, the FAC method has been developed and two characterizations of spacecraft in-flight failures having the highest incidence have been analyzed in detail. A series of at least nine such characterizations is planned. One analysis of spacecraft telecommunication uplink/downlink failures led to the conclusion that redundancy of telecommunications functions is a very poor candidate for relaxation. Another analysis of several hundred thermal sensor failures supported the need to qualify a series of thermal sensors and a standard mounting process that can be used across a variety of spacecraft programs, at potentially higher reliability and lower cost. The paper will present the FAC method and discuss these and any other useful characterizations of spacecraft data that have been completed at the time of the report.